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(54) [Title of the invention] Video signal display device

(57) [Abstract]

In a video signal display device wherein a video signal from a prescribed video source is displayed as display video on a display screen and display is effected with a character expressing prescribed information superimposed on the display video, the display video is displayed through the character, so that the character and the display video are simultaneously displayed: in this way,

display can be effected with a character superimposed on the display video without any sense of incongruity.

Figure 3 Halftone processing

[Claims]

[Claim 1] A video signal display device wherein a video signal from a prescribed video source is displayed as display video on a display screen and display is effected with a character expressing prescribed information superimposed on said display video, characterised in that said display video is displayed through said character, so that said character and said display video are simultaneously displayed.

[Detailed description of the invention]

[0001]

[Table of contents] The present invention will be described in the following order:

Field of industrial application

Prior art (Figure 5 and Figure 6)

Problem that the invention is intended to solve (Figure 6)

Means for solving the problem (Figure 1 and Figure 3)

Action (Figure 1 and Figure 3)

Embodiment (Figure 1 to Figure 4)

Beneficial effect of the invention

[0002]

[Field of industrial application] The present invention relates to a video signal display device and may suitably be applied to a video signal display device constructed such that a channel display is effected superimposed on the programme video.

[0003]

[Prior art] In some conventional video signal display devices such as for example television display devices, the channel number of the programme video in question is arranged to be displayed superimposed on the programme video that is displayed on the display screen.

[0004] Specifically, as shown in Figure 5, the video signal display device 1 divides a character video signal expressing the channel number from the character output control circuit 2 into a red, green and blue component and successively transmits these to a synthesising circuit 3 respectively as a red signal SR1, green signal SG1 and blue signal SB1.

[0005] Also, simultaneously with this, the character output control circuit 2, of the programme video displayed over all of the regions of the display screen, transmits to the synthesising circuit 3 a background cancellation signal SYS1 such as to prevent display of the programme video in synthesis portions where the channel number is to be displayed.

[0006] The synthesis circuit 3 inputs a video signal SV that is received by for example a tuner and demodulated, cancels, by means of the background cancellation signal SYS1, video signals, of this video signal SV, corresponding to synthesis portions where the channel number is to be displayed, and obtains a synthesised video signal SCOM1 by multiplexing the character video signals (SR1, SG1 and SB1) on the red, green and blue primary colour signals of the video signal SV, and outputs this to the CRT (cathode ray tube) 4; video is thereby displayed in which the channel number is combined with the programme video on the display screen of the CRT 4.

[0007] Consequently, as shown in Figure 6, if for example a video of the sun is displayed as the programme video BG on the display screen 4A, display is effected with part of this programme video BG replaced by a channel number character CH representing for example the channel number "1"

[0008]

[Problem that the invention is intended to solve] However, if the channel number was attempted to be displayed by such a method, there were the problems that the programme video BG that is the background of this channel number character became invisible and the programme image BG became difficult to view due to the obstruction presented by a very bright image of the channel number character CH being displayed in part of the programme video BG.

[0009] The present invention was made in view of the above. Its object is to provide a video signal display device whereby a display can be obtained synthesising a prescribed character with a programme image without giving the viewer the impression of an obstruction.

[0010]

[Means for solving the problem] In order to solve this problem, according to the present invention, in a video signal display device 10 wherein a video signal SV1 from a prescribed video source is displayed as display video BG on a display screen 4A and display is effected with a character CH expressing prescribed information superimposed on the display video BG, the

display video BG is displayed through the character CH, so that the character CH and the display video BG are simultaneously displayed.

[0011]

[Action] When display is effected with a character CH expressing prescribed information superimposed on the display video BG that is displayed on the display screen 4A, the display video BG is displayed through this character CH and the character CH and the display video BG are thereby simultaneously displayed: in this way, display of the character CH on the display video BG can be effected without any sense of incongruity.

[0012]

[Embodiment] An embodiment of the present invention is described in detail below with reference to the drawings.

[0013] In Figure 1, in which the same reference symbols are attached to portions corresponding to Figure 5, the video signal display device 10 inputs to the bases of transistors Q1, Q2 and Q3 through respective resistances R1, R3 and R5 a red signal SR1, green signal SG1 and a blue signal SB1 constituting primary colour signals of a character video signal expressing a character signal from a character output control circuit 12.

[0014] The collector side of the transistor Q1 is connected with the power source VCC and its emitter side is connected with earth through a resistance R2; the red signal SR1 constituting the output signal from this emitter side is amplified to a prescribed signal level to constitute an amplified red signal SR2, which is then delivered to an RGB switch circuit 13A of the synthesis circuit 13.

[0015] Also, the collector side of a transistor Q2 is connected with the power source VCC and its emitter side is connected to earth through a resistance R4; the green signal SG1 constituting the output signal from this emitter side is amplified to a prescribed signal level to constitute an amplified green signal SG2, which is then delivered to the RGB switch 13A of the synthesis circuit 13.

[0016] Also, the collector side of a transistor Q3 is connected with the power source VCC and its emitter side is connected to earth through a resistance R6; the blue signal SB1 constituting the output signal from this emitter side is amplified to a prescribed signal level to constitute an amplified blue signal SB2, which is then delivered to the RGB switch 13A of the synthesis circuit 13.

[0017] Also, a character output control circuit 12 elevates the background cancellation signal SYS1 to "H" level with a prescribed timing and inputs this at the base of a transistor Q4 through a resistance R10 so as to prevent display of programme video, of the programme video BG that is displayed over all the regions of the display screen, in the synthesis portion where the channel signal is to be displayed.

[0018] The collector side of the transistor Q4 is connected with the power source VCC and its emitter side is connected with earth through a resistance R11; the background cancellation signal SYS1 constituting the output signal from this emitter side is amplified to a prescribed signal level to constitute an amplified background cancellation signal SYS2, which is then delivered to the RGB switch 13A of the synthesis circuit 13.

[0019] Also, the character output control circuit 12, of the programme video BG that is displayed over all of the regions of the display screen elevates the background colour halftone signal SYM1 to "H" level so as to lower the brightness of the programme video BG in the synthesis portions where the channel number is to be displayed, and to make the colour tone lighter (this is called halftone processing) with a prescribed timing, and outputs this to the base of a transistor Q5 through a resistance R12.

[0020] The collector side of the transistor Q5 is connected with the power source VCC and its emitter side is connected with earth through a resistance R13; the background colour halftone signal SYM1 constituting the output signal from this emitter side is amplified to a prescribed signal level to constitute an amplified background colour halftone signal SYM2, which is then delivered to the background processing circuit 13B of the synthesis circuit 13.

[0021] The background processing circuit 13B inputs a video signal SV1 that is received by for example a tuner and demodulated, and executes background processing such that the video signal corresponding to the synthesis portions, of this video signal SV1, where the channel number is to be displayed, is attenuated whilst the amplified background colour halftone signal SYM2 is elevated to "H" level, and then delivers this to the RGB switch circuit 13A.

[0022] The RGB switch circuit 13A inputs the video signal SV1 and, while the amplified background cancellation signal SYS2 is elevated to "H" level, cancels video signals, of this video signal SV1, corresponding to synthesis portions where the channel number is to be displayed, and obtains a

synthesised video signal SCOM2 by multiplexing the character video signals (SR2, SG2 and SB2) on the red, green and blue primary colour signals of the video signal SV1, and delivers this to the CRT (cathode ray tube) 4; video is thereby displayed in which the channel number is combined with the programme video on the display screen of the CRT 4.

[0023] The character output control circuit 12 is provided with a character halftone signal output terminal INT that is arranged to output a character halftone signal SINT that performs halftone processing that lowers the brightness of the channel number character CH that is displayed on the display screen and that makes the colour tone lighter; the character halftone signal SINT that is output from this character halftone signal output terminal INT is arranged to be output to the R, G and B sides of the output terminals of the character video signals (SR2, SG2 and SB2) respectively through inverter circuits INV1, INV2 and INV3 and resistances R7, R8 and R9.

[0024] Consequently, by elevating the character halftone signal SINT to "H" level with a prescribed timing, the signal level of the character video signals (SR2, SG2 and SB2) is lowered whilst this character halftone signal SINT is elevated to "H" level and halftone processing is thereby performed in respect of the channel number character CH.

[0025] By means of this construction, the video signal display device 10 executes processing that displays the channel number character CH on the programme video when a new channel is specified by the viewer or when a channel display command is specified.

[0026] Specifically, when the internal timer is started in response to an input command by the viewer, the character output control circuit 12 simultaneously outputs character video signals (SR2, SG2 and SB2) synchronised with the video signal SV1.

[0027] Also, a condition is then maintained in which the character halftone signal SINT is held at "L" level.

[0028] Consequently, one horizontal line of character video signals (SR2, SG2 and SB2) of the display screen 4A, as shown in Figure 2(A), (B) and (C), respectively, is elevated to the pre-set maximum signal level during the period from the time-point t2 to the time-point t3, corresponding to the region in which the channel number character CH is displayed.

[0029] Also, at this point, the background cancellation signal SYS1 is elevated to "H" level in synchronisation with the character video signals (SR2, SG2 and SB2) and (Figure 2(D)) and a condition is maintained (Figure 2(E))

in which the background colour halftone signal SYM1 is maintained at "L" level: in this way, it is arranged that the background video BG based on the video signal SV1 is not displayed in the portions where the channel number character CH is to be displayed.

[0030] As a result, as shown in Figure 3(A), on the display screen 4A of the CRT 4, display is effected with part of the programme video BG replaced by the channel number character CH displaying with maximum brightness the channel number "1" specified by the viewer (i.e. the channel number character CH is displayed with priority over the programme video BG).

[0031] When the count value of the internal timer of the character output control circuit 12 counts a pre-set time (for example 3 sec), the character halftone signal SINT is elevated to "H" level and the amount of the rise in signal level of the character video signals (SR2, SG2 and SB2) is thereby decreased during the period from the time-point t2 to the time-point t3 by approximately 50% of the maximum level, as shown in Figure 2(F), (G) and (H).

[0032] Consequently, the brightness of the channel number character CH diminishes by approximately 50% of the maximum value and its colour tone becomes lighter.

[0033] Also, at this point, a condition in which the background cancellation signal SYS1 is held at "L" level is maintained (Figure 2(I)) and the background colour halftone signal SYM1 is elevated to "H" level synchronously with the character video signals (SR2, SG2 and SB2) (Figure 2(J)); the brightness of the programme video BG based on the video signal SV1 is thereby lowered in the portions where the channel number character CH is displayed, and its colour tone becomes lighter.

[0034] As a result, on the display screen 4A of the CRT 4, as shown in Figure 3(B), the channel number character CH expressing the channel number "1" specified by the viewer is displayed in part of the programme video BG with a brightness and colour tone of approximately 50% of the maximum brightness, and the brightness and colour tone of the programme video BG are displayed reduced to approximately 50% in the display region of this channel number character CH.

[0035] Consequently, in the region where the channel number character CH is displayed on the display screen 4A, the channel number character CH and the programme video BG can be simultaneously displayed with the prescribed brightness (i.e. brightness matching the brightness of the display

screen 4A as a whole), so an effect can be obtained as if the programme video BG is displayed through the channel number character CH. Consequently, the viewer can simultaneously recognise both of the images without any sense of incongruity.

[0036] Furthermore, since the channel number character CH is displayed in a condition of reduced brightness and colour tone in a programme video BG with a large display region, the viewer can preferentially recognise the entire programme video BG of large display region, so that, even though the channel number character CH is displayed, the programme video BG becomes considerably easier to view as a whole.

[0037] With a construction as described above, by displaying the programme video BG and channel number character CH in combined manner in halftone fashion, the programme video BG can be displayed through the channel number character CH, and, in this way, the channel number character CH can be displayed within the programme video BG with no sense of incongruity.

[0038] It should be noted that, although, in the embodiments described above, the case was described where when a channel is newly specified by the viewer or when a channel display command is specified, the region in which halftone processing of the programme video BG is carried out after preferentially displaying the channel number character CH for a prescribed time in the programme video BG is restricted to the portion where the channel number character CH is to be displayed, the present invention is not restricted to this, and halftone processing could be performed of a prescribed region including the portion where the channel number character CH is to be displayed.

[0039] Specifically, as shown in Figure 2(K) to (O), by elevating the background colour halftone signal SYM1 to "H" level between time points t1 to t4 including the time points t2 to t3 at which the character video signals (SR2, SG2 and SB2) were elevated and including a prescribed period before and after these time-points t2 to t3, as shown in Figure 4, the region of the programme video BG on the display screen 4A that is subjected to halftone processing can be made to include not only the portion where the channel number character CH is displayed but also, as a whole, a prescribed region ARA peripheral to this portion where the channel number character CH is displayed.

[0040] As a result, the comparatively small region where the channel number character CH is displayed, of a programme video BG of large display region, can be made considerably easier for the viewer to recognise.

[0041] Also, although, in the embodiments described above, the case was described where when a channel is newly specified by the viewer or when a channel display command is specified, the channel number character CH was displayed preferentially to the programme video BG for three seconds, the present invention is not restricted to this and various times could be employed.

[0042] Also, although, in the embodiments described above, the case was described where the signal level of the character of video signals (SR2, SG2 and SB2) was reduced to approximately 50% of the maximum level by the character halftone signal SINT, there is no restriction to this rate of reduction and various rates of reduction could be employed.

[0043] In this case, the voltage division ratios of the resistances R1 and R7, R3 and R8 and R5 and R9 (Figure 1) should be altered.

[0044] Also, although, in the embodiments described above, the case was described in which, when a channel was newly specified by the viewer or when a channel display command was specified, the channel number character CH was displayed, the programme video BG was cancelled in the portion where the channel number character CH was to be displayed, for a prescribed time prior to execution of the halftone processing, the present invention is not restricted to this and it would be possible to synthesise the channel number character CH without cancelling the programme video BG.

[0045] Also, although, in the embodiments described above, the case was described in which halftone processing of the programme video BG and the channel number character CH was performed in the portion where the channel number character CH was to be displayed, the present invention is not restricted to this, and halftone processing could be performed solely in respect of the programme video BG.

[0046] Also, although, in the embodiments described above, the case was described in which brightness was lowered and colour tone was lightened by halftone processing, the present invention is not restricted to this and it would be possible to perform processing consisting solely of one or other of brightness lowering processing or colour tone lightning processing as halftone processing.

[0047] Also, although, in the embodiments described above, the case was described in which the channel number character CH was displayed, the

present invention is not restricted to this and it would be possible to employ the present invention widely when displaying a character indicating various other types of information such as a volume display character in combination with the programme video.

[0048] Furthermore, although, in the embodiments described above, the case was described in which video of a broadcast programme received by the tuner was displayed as the programme video, the present invention is not restricted to this, and it would be possible to employ the present invention widely when displaying various other types of video such as video reproduced by for example a video tape recorder.

[0049]

[Benefit of the invention] As described above, with the present invention, by displaying display video through a character representing prescribed information, display can be achieved in which a character is superimposed on display video without any sense of incongruity.

[Brief description of the drawings]

[Figure 1] This is a connection diagram showing an embodiment of a video signal display device according to the present invention.

[Figure 2] This is a signal waveform diagram that is provided in explanation of the operation of halftone processing according to the present invention.

[Figure 3] This is a line diagram showing a display image when halftone processing according to the present invention is executed.

[Figure 4] This is a line diagram showing a display screen according to another embodiment.

[Figure 5] This is a block diagram showing a video signal display device according to the prior art.

[Figure 6] This is a line diagram showing a display image according to the prior art.

[Explanation of the reference symbols]

1, 10... video signal display devices, 2, 12... character output control circuits, 3, 13... synthesis circuits, 4... CRT, 4A... display screen, SR2, SG2, SB2... character video signals, SINT... character halftone signal, SYS1... background cancellation signal, SYM1 one... background colour halftone signal, BG... programme video, CH... channel number character.

Figure 1 Construction of an embodiment

10 video signal display device
13 RGB switch
13B background processing

Figure 2 Halftone processing operation

Figure 3 Halftone processing

Figure 4 Other embodiment

Figure 5 Prior art
1 video signal display device
2 character output control
3 synthesis circuit

Figure 6 Prior art channel display